Fig. 1A

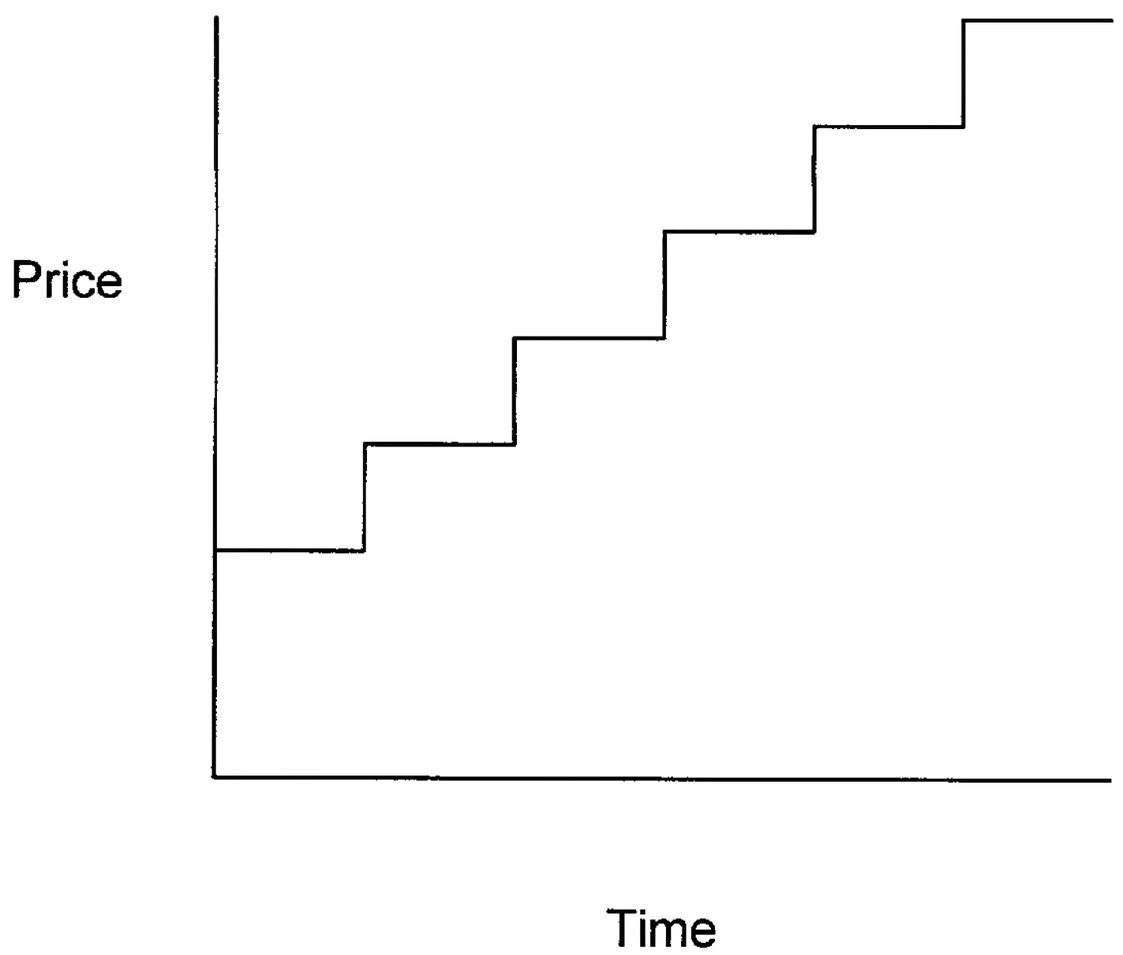


Fig. 1B

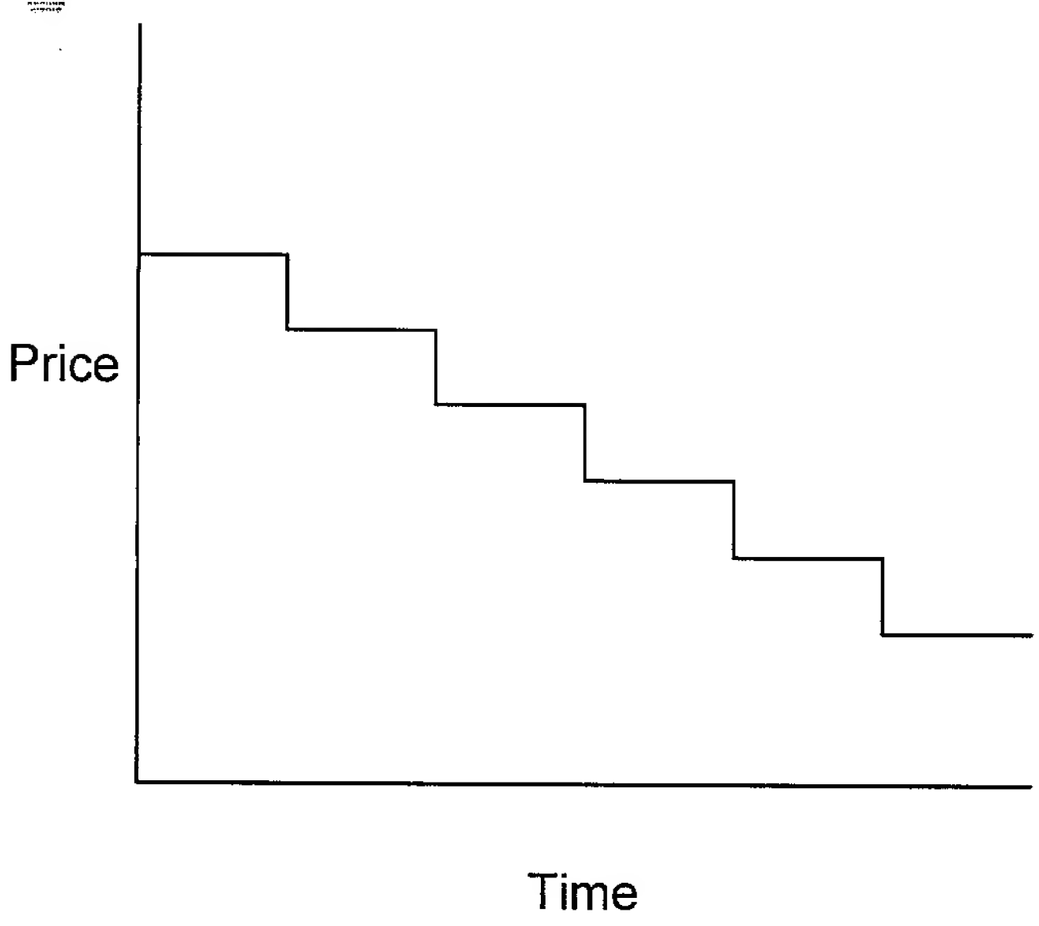


Fig. 1C

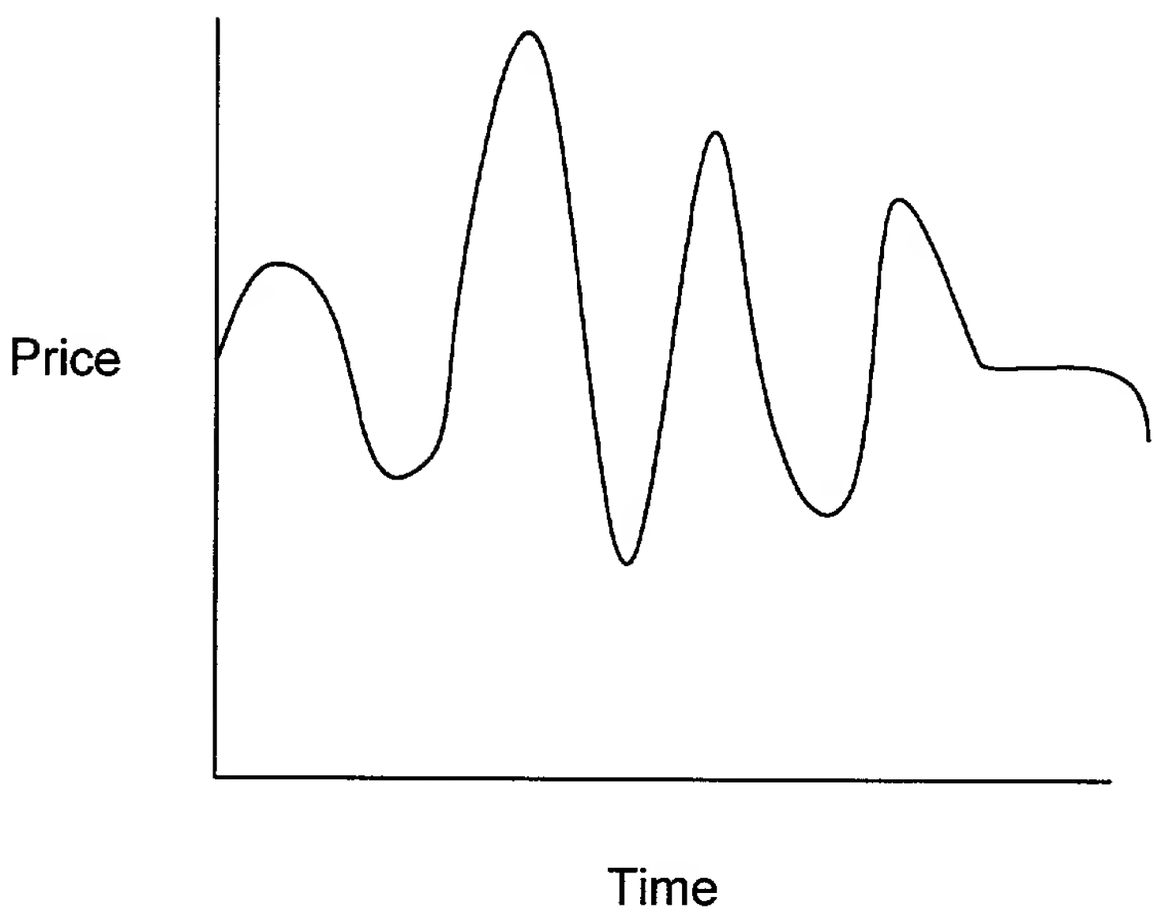


Fig. 1D

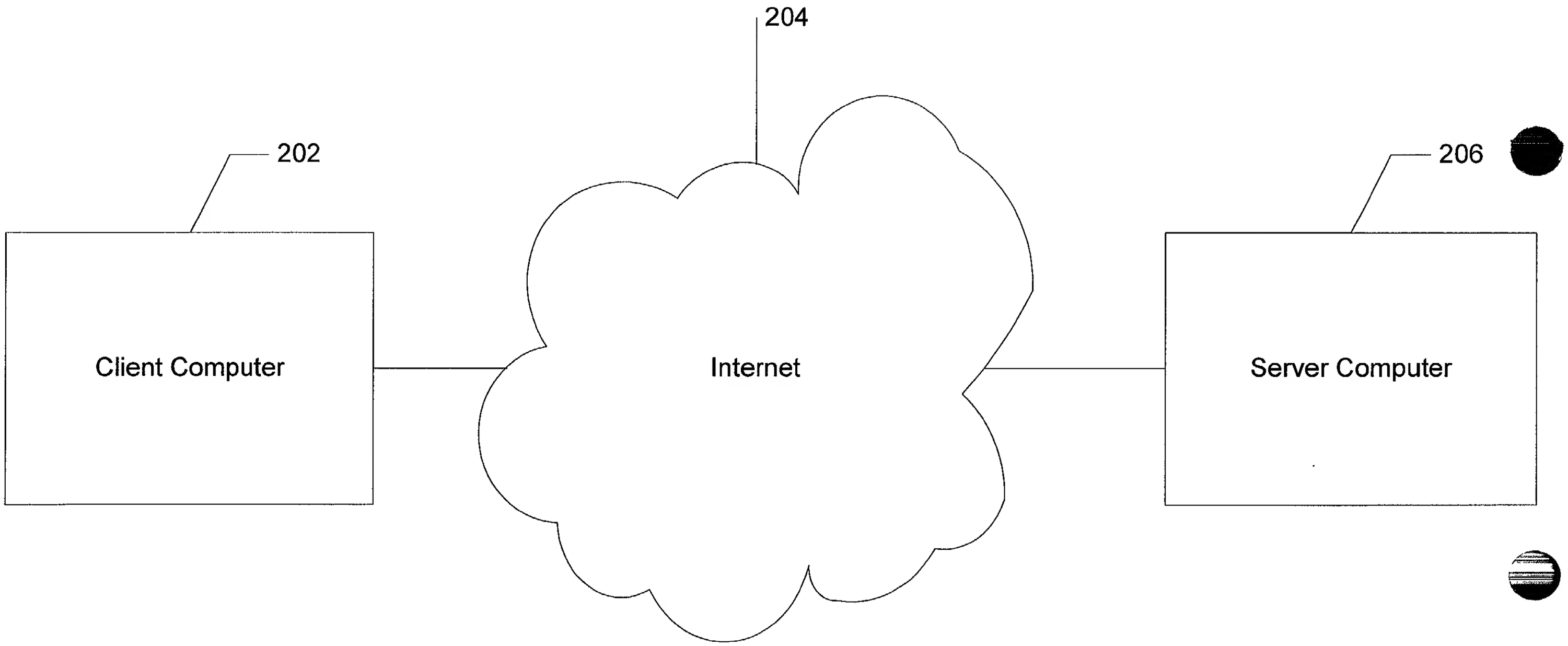


Fig. 2

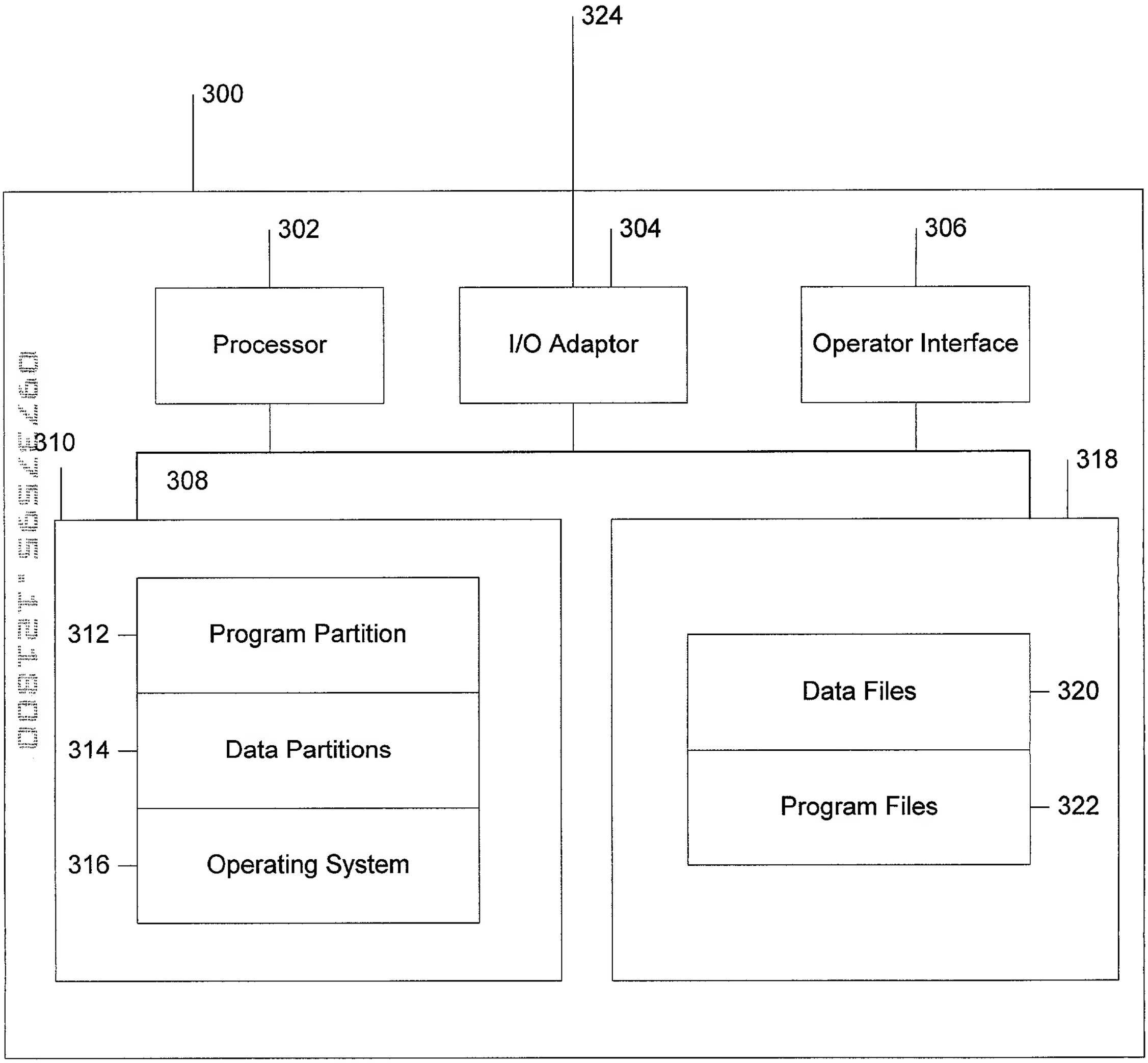

324
300
302
304
306
Processor
I/O Adaptor
Operator Interface
310
308
318
312
Program Partition
314
Data Partitions
316
Operating System
Data Files
320
Program Files
322

Fig. 3

Trading Pit's data structures

405
Table of users and brokers

407
Market description

420
Pending orders

422
Indexing tree of sell orders

425
List of buy orders

430
Priority queue of scheduled events

Fig. 4A

Broker's data structures

430
Table of users and UIs supported by this broker

437
Market description

440
List of pending orders placed through this broker

450
List of recent messages to the trading pit

460
Priority queue of scheduled events

Fig. 4B

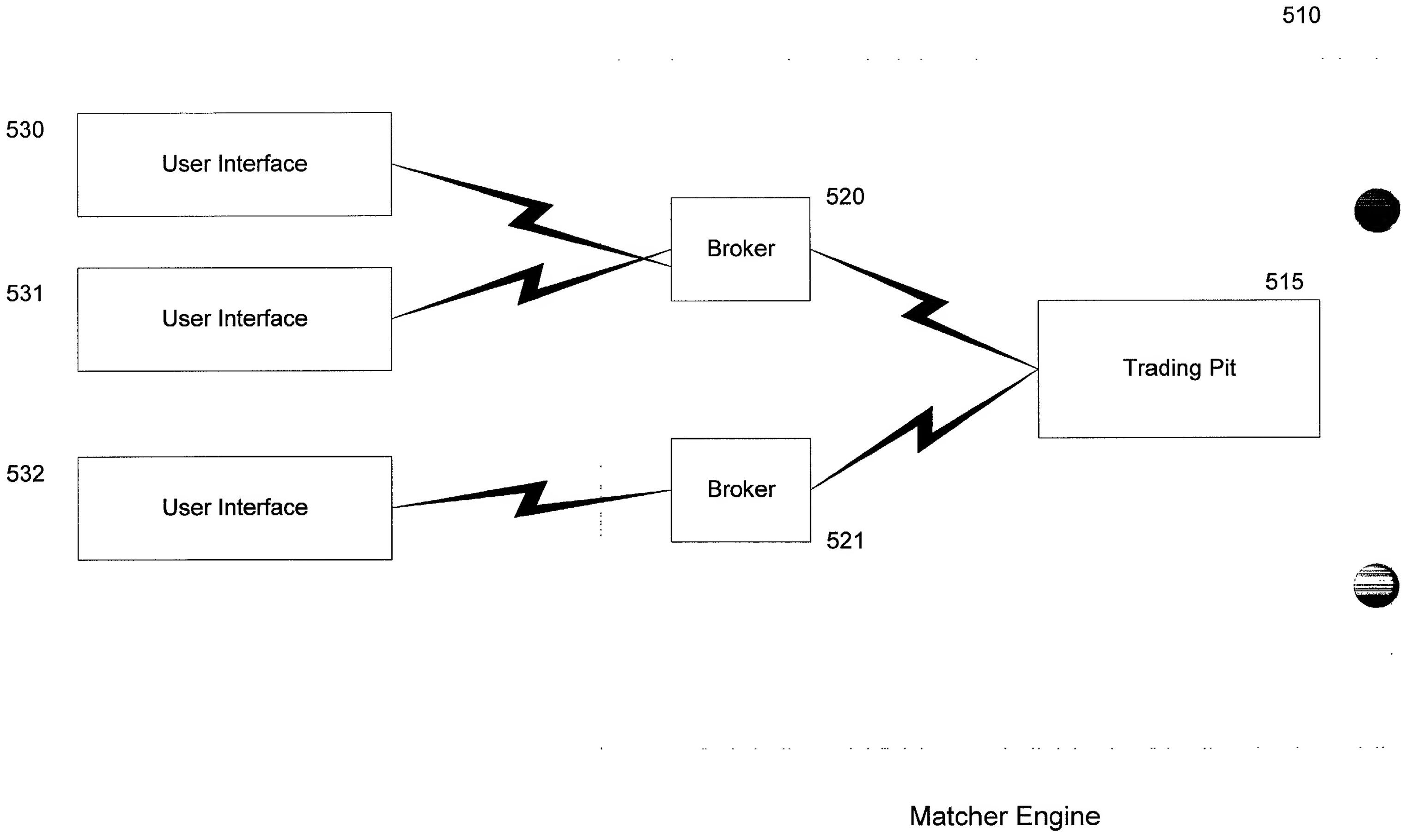

510
530
User Interface
531
User Interface
532
User Interface
520
Broker
Broker
521
515
Trading Pit
Matcher Engine

Fig. 5

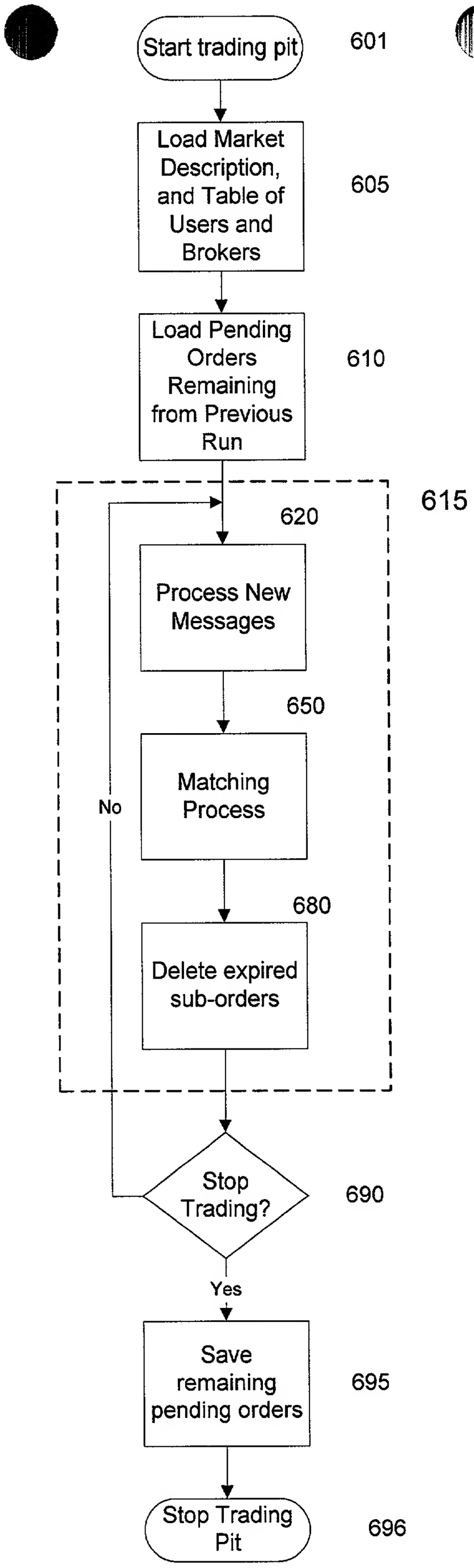

Start trading pit
601
Load Market Description, and Table of Users and Brokers
605
Load Pending Orders Remaining from Previous Run
610
615
620
Process New Messages
650
Matching Process
No
680
Delete expired sub-orders
Stop Trading?
690
Yes
Save remaining pending orders
695
Stop Trading Pit
696

Fig. 6

Fig. 7

620

705 Add, Modify or Delete Sub-Order?

Add

710 Buy or Sell Sub-Order?

Buy

750 Matching Process

751 Sub-Order Filled?

Yes

No

752 Add Sub-Order to Buy Order List

Sell

720 Add Sub-Order to Indexing tree of Sell Orders

755 Add Sub-Order's Expiration Time to Events

756 Another disjunctive order to add?

Yes

No

Modify

759 Modify Sub-Order

760 Buy or Sell Sub-Order?

Buy

762 Change may lead to new matches?

Yes

765 Matching Process

770 Sub-Order Filled?

Yes

772 Delete sub-orders of corresponding disjunctive order

No

Sell

763 Update indexing tree, if price is being modified

No

775 If modifying expiration time, update its place in Priority Queue of Events

Delete

780 Buy or Sell Sub-Order?

Buy

782 Delete Sub-Order from Buy Order List

Sell

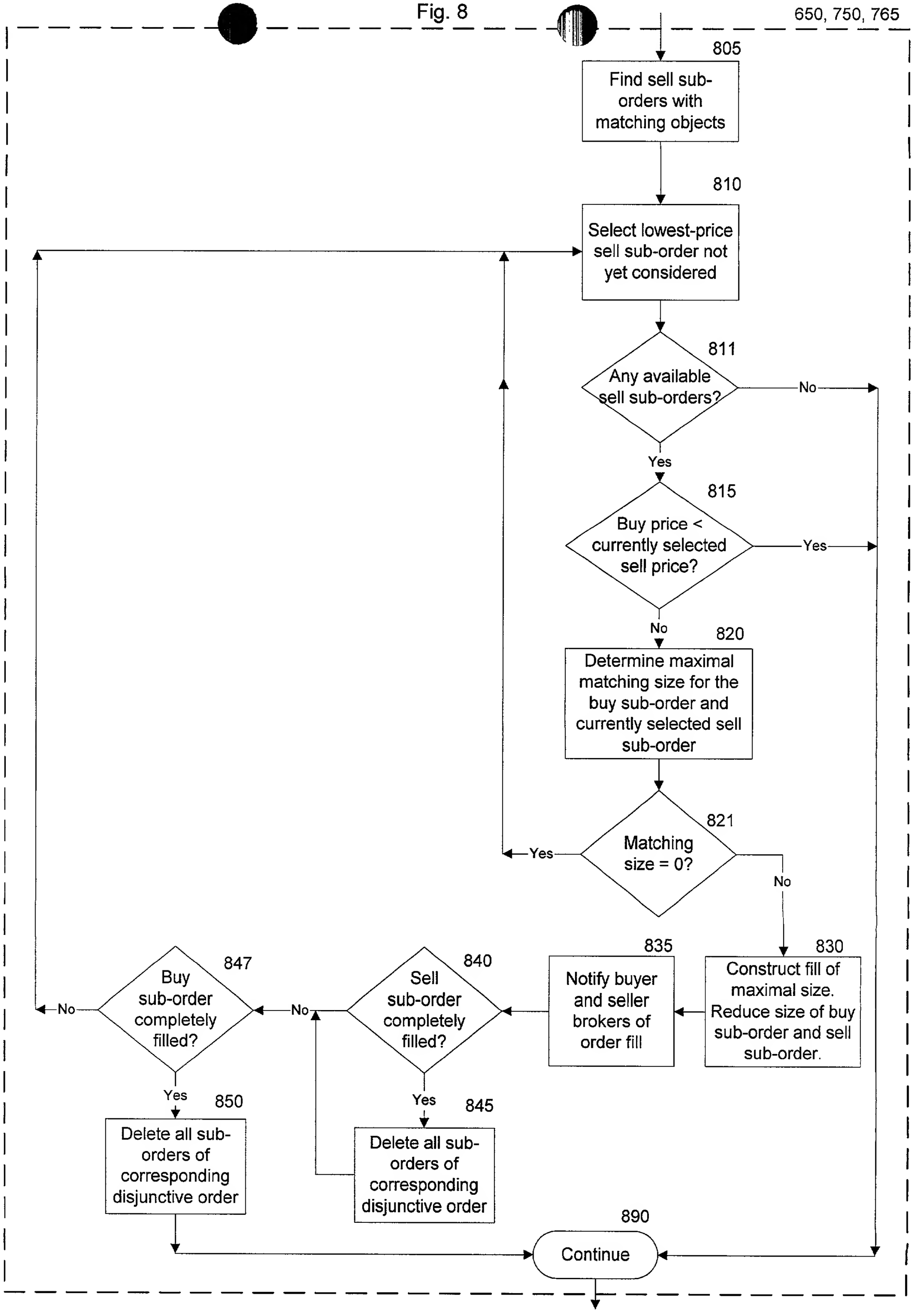
784 Delete Sub-Order from Indexing Tree of Sell Orders

785 Delete Sub-Order's Expiration time from Events

790

Send Confirmation Message to corresponding broker

Fig. 8


650, 750, 765
805
Find sell sub-orders with matching objects
810
Select lowest-price sell sub-order not yet considered
811
Any available sell sub-orders?
No
Yes
815
Buy price < currently selected sell price?
Yes
No
820
Determine maximal matching size for the buy sub-order and currently selected sell sub-order
821
Matching size = 0?
Yes
No
830
Construct fill of maximal size. Reduce size of buy sub-order and sell sub-order.
835
Notify buyer and seller brokers of order fill
840
Sell sub-order completely filled?
No
Yes
845
Delete all sub-orders of corresponding disjunctive order
847
Buy sub-order completely filled?
No
Yes
850
Delete all sub-orders of corresponding disjunctive order
890
Continue

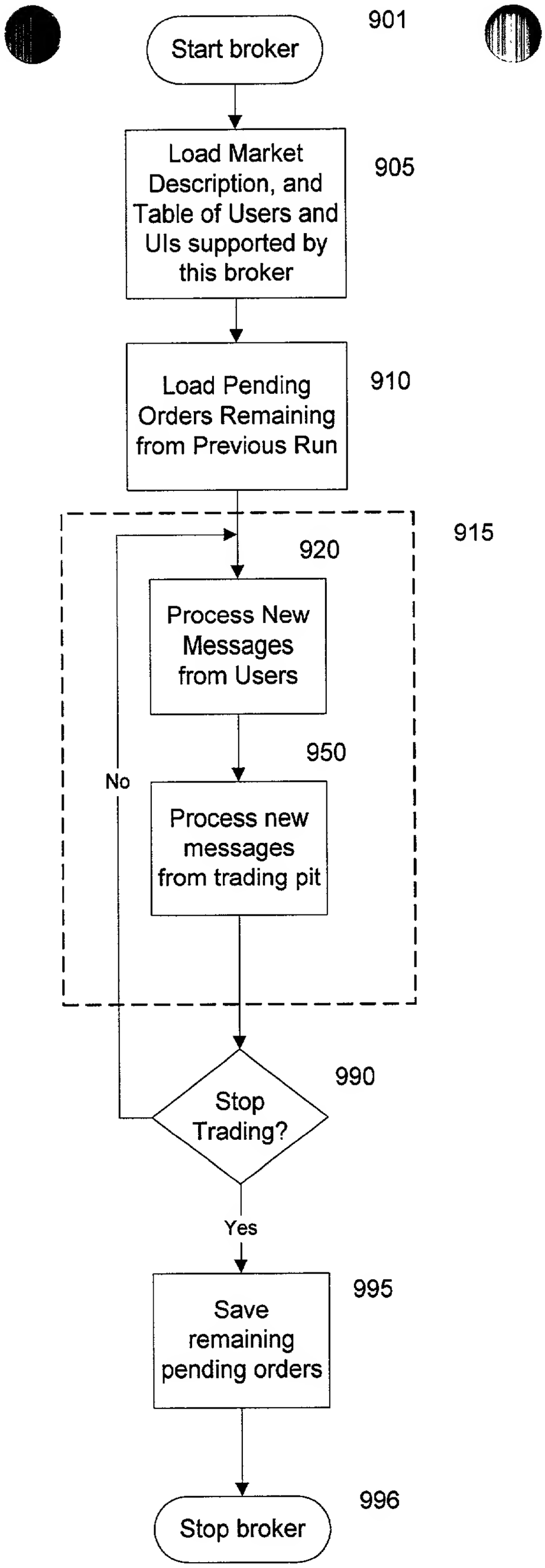

Start broker
901
Load Market Description, and Table of Users and UIs supported by this broker
905
Load Pending Orders Remaining from Previous Run
910
915
920
Process New Messages from Users
950
Process new messages from trading pit
No
990
Stop Trading?
Yes
995
Save remaining pending orders
996
Stop broker

Fig. 9

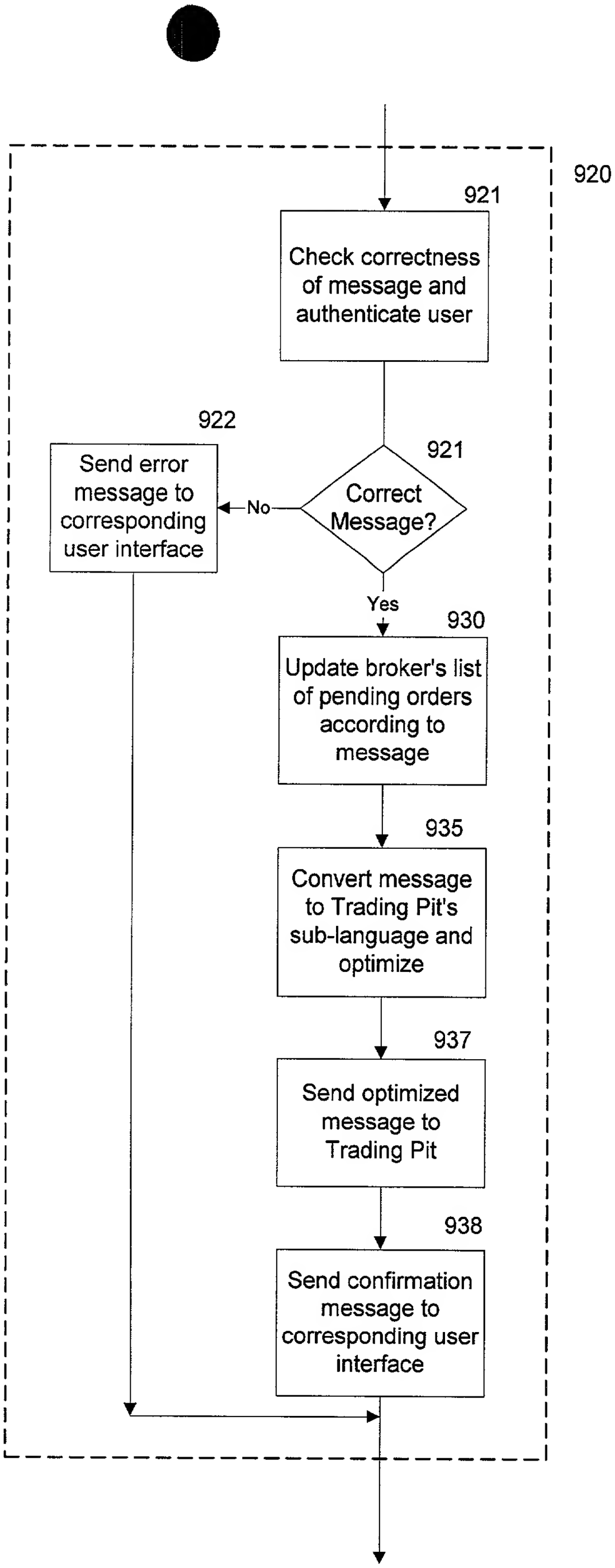

920
921
Check correctness of message and authenticate user
922
921
Send error message to corresponding user interface
No
Correct Message?
Yes
930
Update broker's list of pending orders according to message
935
Convert message to Trading Pit's sub-language and optimize
937
Send optimized message to Trading Pit
938
Send confirmation message to corresponding user interface

Fig. 10

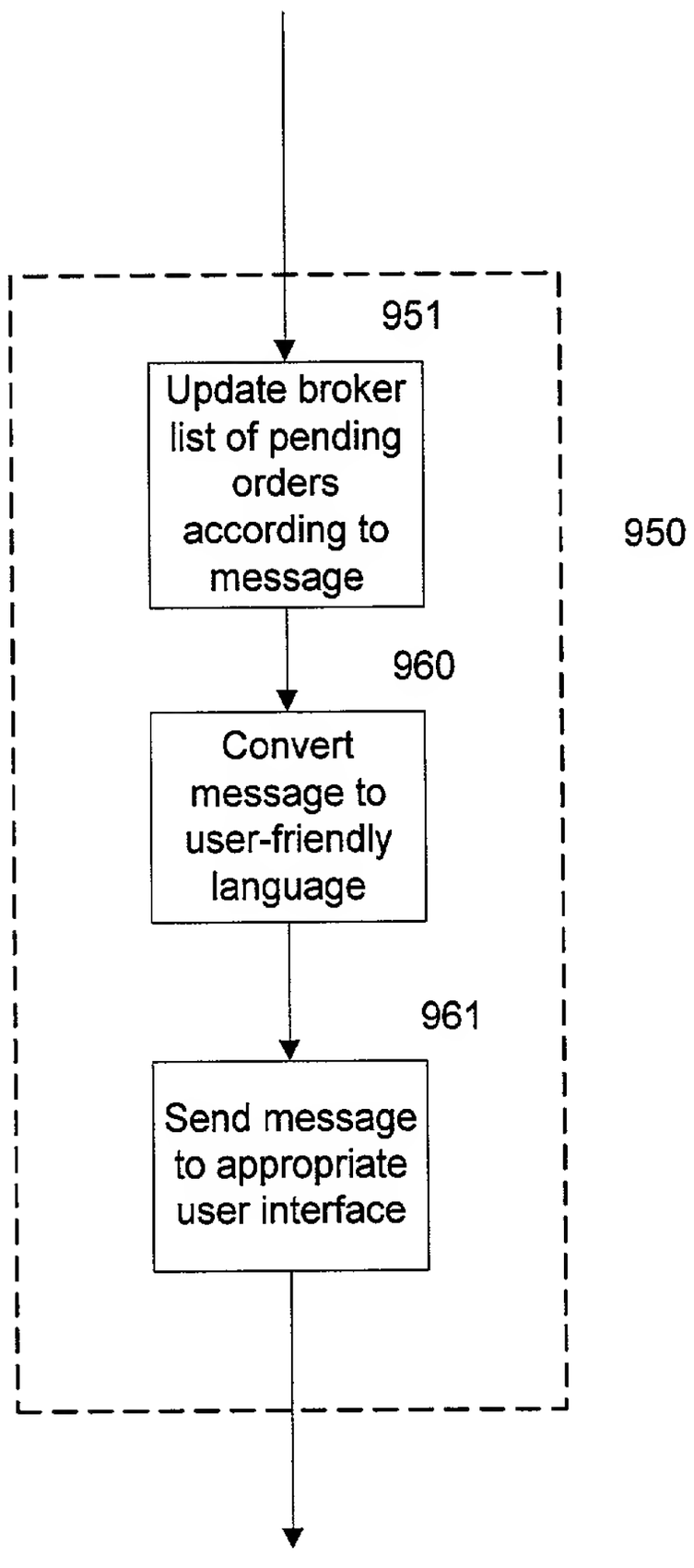
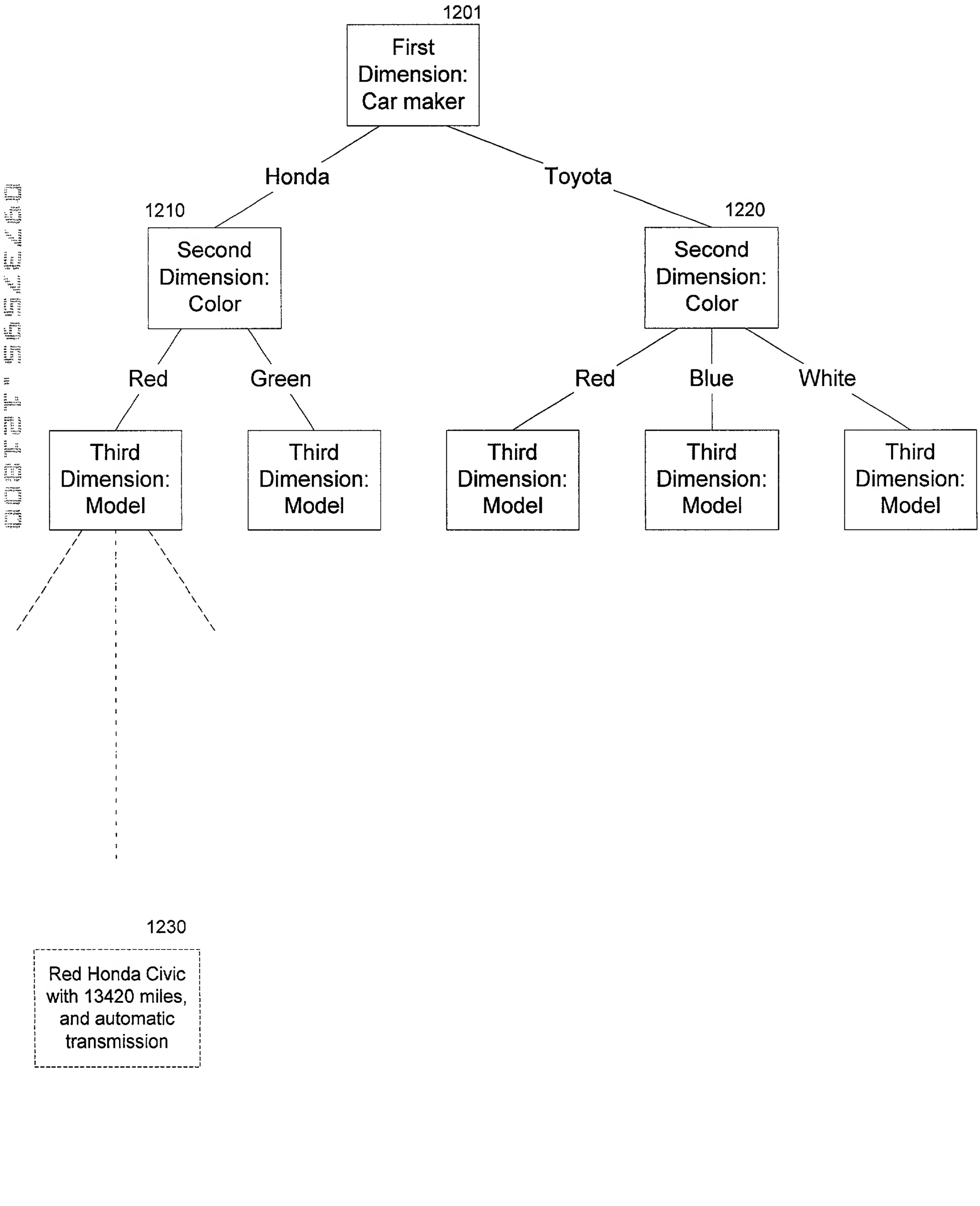

951
Update broker list of pending orders according to message
950
960
Convert message to user-friendly language
961
Send message to appropriate user interface

Fig. 11

Fig. 12


1201
First Dimension: Car maker
Honda
Toyota
1210
1220
Second Dimension: Color
Second Dimension: Color
Red
Green
Red
Blue
White
Third Dimension: Model
Third Dimension: Model
Third Dimension: Model
Third Dimension: Model
Third Dimension: Model
1230
Red Honda Civic with 13420 miles, and automatic transmission